

Certificate of Compliance

Certificate: 1294176

Master Contract: 209996

Project: 1294176

Date Issued: July 11, 2002

Issued to: Seika Mikrosystemtechnik GmbH
Ellharter StraBe 10
D-87435 Kempten
GERMANY

The products listed below are eligible to bear the CSA Mark shown



Issued by: Andrew Redeker, C.E.T.
Certification Specialist

Authorized by: John Verwey, P.Eng.
Operations Manager

CLASS

2258 04 - PROCESS CONTROL EQUIPMENT - Intrinsically Safe, Entity - For Hazardous Locations

PRODUCTS

Class I, Division 1, Groups A, B, C, D; Ex ia IIC T4

SB2i Inclination / Acceleration Sensor; Maximum Ambient 85°C; Temperature Code T4; Enclosure Type 4;
Intrinsically Safe with the following Entity Parameters per measurement output;

Connections S11, S12 and S21, S22

Vmax, Ui = 30V; Imax, Ii = 78mA; Ci = 24nF; Li = 66uH

APPLICABLE REQUIREMENTS

- | | | |
|-------------------------------|---|--|
| CSA Standard C22.2 No 0-M1991 | - | General Requirements - Canadian Electrical Code Part II. |
| 94-M1991 | - | Special Purpose Enclosures. |
| 157-M1992 | - | Intrinsically Safe and Non-Incendive Equipment for Use in Hazardous Locations. |
| CAN/CSA E79-0-02 | - | Electrical apparatus for explosive gas atmospheres. PART 0: General requirements. |
| E79-11-02 | - | Electrical apparatus for explosive gas atmospheres. PART 11: Intrinsic safety "i". |



Supplement to Certificate of Compliance

Certificate: 1294176

Master Contract: 209996

*The products listed, including the latest revision described below,
are eligible to be marked in accordance with the referenced Certificate.*

Product Certification History

Project	Date	Description
1294176	July 11, 2002	Original Certification.



Descriptive and Test Report

MASTER CONTRACT: 209996

REPORT: 1294176

PROJECT: 1294176

Edition 1: July 11, 2002; Project 1294176 - Edmonton
Issued by Andrew Redeker, C.E.T.

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The test report shall not be reproduced, except in full, without the approval of CSA International.

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MARKINGS

- (1) Submitter's name, trademark, or the CSA file number (adjacent the CSA Mark).
- (2) Catalogue / Model designation.
- (3) Complete Entity Parameters (Vmax, Ui = 30V; Imax, Ii = 78mA; Ci = 24nF; Li = 66uH)
- (4) Date code / Serial number traceable to month and year of manufacture.
- (5) Exia, CI I, Div 1, Gr A,B,C,D, T4
- (6) Ex ia IIC T4
- (7) The words "INTRINSICALLY SAFE".
- (9) -40°C Tamb 85°C
- (10) CSA Enclosure Type 4
- (11) The CSA Mark.

ALTERATIONS

- 1) Markings as noted above
- 2) The Encapsulation shall completely cover the electronics as per Illustration 3
- 3) Diode D1 Shall be Diotec P/N S80 (0.8A/160V minimum)

FACTORY TESTS

Dielectric:

The equipment at the conclusion of manufacture, prior to shipment, shall withstand for one minute without breakdown, the application of 500 Vac between extra-low voltage circuits and non current carrying parts if such circuits leave or enter the enclosure.

NOTES:

- (1) As an alternative, potentials 20 percent higher may be applied for one second.
- (2) The required dielectric strength test may be made by applying a dc potential, providing it is 1.414 times the ac test potential.

WARNING:

The factory test(s) specified may present a hazard of injury to personnel and/or property, and should be performed by persons knowledgeable of such hazards, and under conditions designed to minimize the possibility of injury.

DESCRIPTION

The SB2i is a pressure die cast aluminum sensor housing with two integrated sensors for measuring inclinations and / or accelerations along two axis. As well as the sensors, the box contains two independent signal conditioners, each with a 4-20mA, 2-wire output and two separate, voltage supplies feeding off of the corresponding current loop, one for each sensor. Furthermore, each signal conditioner includes an active low pass filter, whose upper cut-off frequency / setting time can be adjusted to suit the measurement task, an output stage with current limitation, a noise voltage filter and a diode bridge for unipolar connection to the current loop. Interference signals caused by unwanted ground currents are eliminated by electrically isolating each sensor and signal conditioner from each other and the housing. Refer to Figure 1 for Catalog sheets. Refer to Illustrations 1, 2 and 3 for construction details.

ENCLOSURE

BASE

The base of the enclosure measures approx 63.7mm x 97.7mm x 26mm with a 1.46mm high lip that mates with a groove in the lid that contains a gasket. The base is provided internally with four (4) raised bosses to secure the circuit board. It is also provided with two (2) through holes that can be used to mount the overall equipment. A cable entry is provided in the base for connection of the equipment to the supply circuit. The cable used may be a 3 or 4-wire cable and the cable must be provided with a suitable cable entry gland.

COVER

The cover of the enclosure measures approx 63.6mm x 97.7mm x 10.2mm with a 2.4mm wide by 3.7 deep o-ring groove. Four (4) screws hold the cover to the base.

GASKET

The gasket is approx 3.3mm in diameter and is placed in the groove cut into the cover.

ELECTRONICS

MAIN BOARD

Refer to Figure 2 for Schematic.
Refer to Figure 3 for Parts List
Refer to Figure 4 for Board Drawings.

CRITICAL I.S. COMPONENTS

D1/1, D1/2	Diode P/N S80 (0.8A/160V minimum)
C6/1, C6/2, C7/1, C7/2	Capacitor, 10nF \pm 20% Maximum
L1/1, L2/1, L1/2, L2/2	Chip Inductor 33uH Nominal
Potting Compound	Wacker, Silicone rubber, RTV-2 (To completely cover all electronics to a minimum depth of 0.5mm)

SENSORS

Refer to Figure 5 for a schematic of the sensors. Any of the following sensors may be installed in the SB2i.

B1, B2, B3 See Figure 6
N2, N3, N4 See Figure 7

TEST REPORT

INTRINSICALLY SAFE ANALYSIS

ENTITY PARAMETERS

- V_{max}, U_i - A maximum voltage of 30Vdc was chosen as this will not invalidate the circuit board spacings under the potting compound.
- I_{max}, I_i - A maximum of 78mA per measurement output was chosen as this will not invalidate the ratings of the protective components. Furthermore, this will limit the maximum power on any given component to less than 0.8W when both measurement outputs are combined.
- C_i - C_i has been calculated per measurement output as the parallel combination of C6 and C7 + tolerances = 24nF
- L_i - L_i has been calculates per measurement output as the series combination of L1 and L2 - 66H

INTERNAL CAPACITANCE - Due to protective bridge diode D1 and the fact that the entire assembly is encapsulated to a minimum depth of 0.5mm above all components, the internal capacitance is not accessible for spark ignition testing. Therefore assessment of the internal capacitance is not requires.

INTERNAL INDUCTANCE - Due to protective bridge diode D1 and the fact that the entire assembly is encapsulated to a minimum depth of 0.5mm above all components, the internal inductance is not accessible for spark ignition testing. Therefore assessment of the internal inductance is not requires.

PROTECTIVE COMPONENTS - The only protective component is D1. This component has a voltage rating of 160V minimum and a current rating of 0.8A. The maximum I.S. barrier voltage is 30V and combined I.S. barrier current is 156mA. These parameters are less than 2/3 of the nominal ratings of D1.

TEMPERATURE CODE RATING - Components L1 and L2 have a nominal resistance of 4 Ohms. With a current of 156mA, these components will dissipate less than 0.1W. Bridge diode D1 will dissipate a maximum of 0.37W (2 * 1.2V * 156mA) under fault conditions. Since the maximum combined I.S. barrier output will be 30V * 156mA / 4 = 1.17W and diode D1 will dissipate 0.37W, this leaves a maximum of 0.8W for all other components downstream of D1. In an 85°C ambient and with the entire circuit board encapsulated, a T4 temperature code rating was deemed acceptable.

ENVIRONMENTAL PROTECTION

TYPE 4 HOSEDOWN

Hosedown testing was not performed on a sample of the SB2i as the sample is completely encapsulated and leaves little to no volume for water to enter the enclosure.

GASKET COMPRESSION

Gasket compression tests not performed as the cover does not need to be removed to make electrical connections.

EXTERNAL FORMATION OF ICE

There are no external cavities where ice could form. No testing required.

CORROSION RESISTANCE

Corrosion resistance tests not performed as the enclosure is a painted die cast Aluminum Enclosure.

No further testing was deemed necessary